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THE FIRST STAGE IN THE NATURAL HISTORY OF THE HUMAN SCALP HAIR CYCLE*

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The cyclical activity of the hair follicle of the scalp is continuously maintained from the first formation of the follicle during embryonic life until death of the individual; but the manner in which the phases of the cycle change in pattern of distribution within the scalp presents characteristics related to the age of the individual. These changes are separable into well-defined periods.

One of these periods extends from the embryonic formation of the follicle until 40 weeks after birth, a period which may reasonably be termed "the first stage of the natural history of human scalp hair".

MATERIALS AND METHODS

With the same technics used previously (1, 2, 3) we studied the state of the cycle of scalp hair in 80 individuals: 30 premature infants† and fetuses, 30 newborn normal term children, and 20 children between birth and 40 weeks of age.

RESULTS

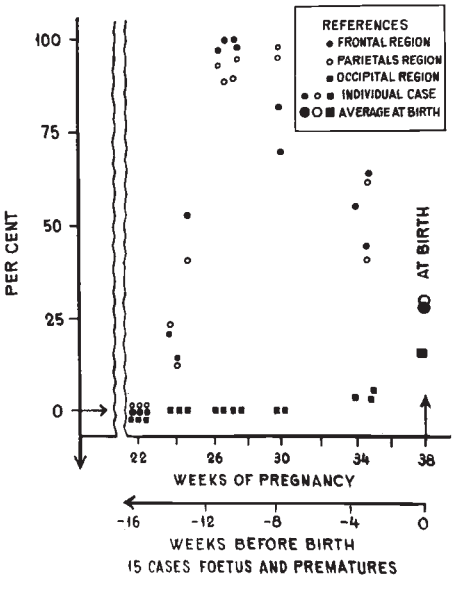
The origin of the hair follicle of the scalp begins just prior to the 4th month of intrauterine life, developing in such a way that, at about the 5th month, hair in the anagen growth phase is found in well-formed follicles. About this time, in the majority of fetuses, a sudden change takes place in the phases of the cycle in the frontal and parietal regions in such a manner and so rapidly that in the course of 8 to 10 weeks all the hairs pass from the anagen to the catagen and the telogen phase (Graphs 1 and 2).

This change starts in the frontal region, and within 7 to 10 days extends to the parietal regions. At this time these changes do not appear in the occipital region, where hairs continue in anagenic phase until near the time of birth, when an abrupt transition of phase occurs.

Between 6 and 5 weeks before birth a new cycle of anagen is detectable in the frontal and parietal scalp in the majority of cases, signifying the intrauterine production of a new coat of hair in these areas. Consequently at the time of birth, the scalp hair shows an overlap of an ending cycle with one just beginning, as shown by the following regional averages of catagens plus telogens: frontal 31.6%; parietal 26.1% and occipital 15.1% (3) (Graphs 1–3).

Certain differences, apparently related to the complexion of the skin, seem worthwhile noting. The newborn infant of dark complexion, compared with infants of lighter complexion, presents: (1) a delay in the onset of these changes (Tables 1 and 2) and (2) thicker and more abundant hair (Graph 4).

The cycles are repeated a few weeks after



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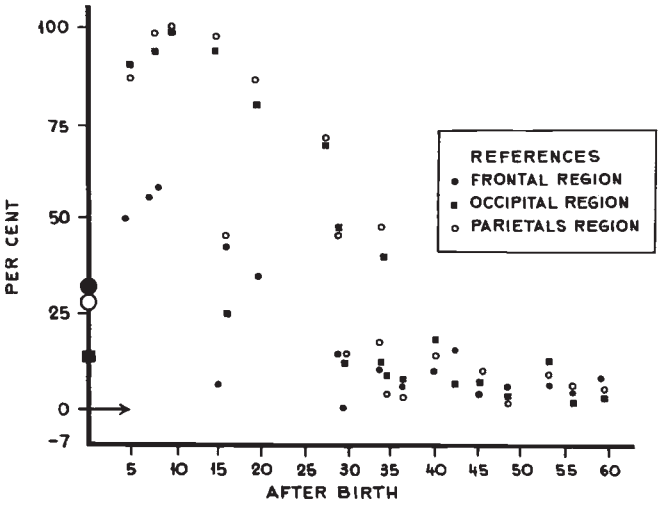
† Although the WORLD HEALTH ORGANIZATION defines as premature all new-borns weighing less than 2,500 gms, in this investigation we have only considered as premature a newborn when the duration of pregnancy was less than normal.



birth, and as a consequence the parietal and occipital regions become covered by hairs practically all in telogenic phase, while in the frontal region hair in telogenic phase comprises only 60%. The change to anagen phase starts in the frontal region and progresses towards the parietal and the occipital regions. (Graphs 2 and 3)

Between the 10th to the 16th week after birth the phase of the cycle in all regions becomes the same, and while maintaining the initial tendency of spreading from front to back, certain new particularities are noted: (1) the rapidity of change of phase of cycle is slower than those occurring earlier; and (2) the subsequent changes are much slower as time passes, and at about 40 weeks the distribution of the phases adopts a pattern very much like that pre-pubertal children, *i.e.* between the ages of 3 and 11 years (Graphs 2 and 3).

It should also be mentioned that with increased age during the prepubertal years there is an increase in the number of thicker medullated hairs, whereas before birth, hairs lack medullae, and are thin.

DISCUSSION

Before birth, at the time of birth, and thereafter the scalp hair passes through all phases of the cycle. Early in fetal development, at about the 5th month of pregnancy, all hair of the scalp is in anagen phase. Although this uniformity of growth phase may occasionally be repeated in adulthood under pathologic circumstances, it will never again occur normally after these early developmental periods. Between the 10th to the 8th week be-

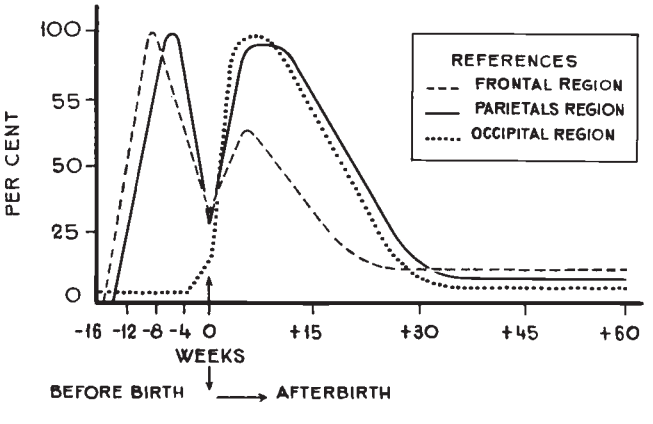


TABLE I

New born children
Fair complexion
Phases of the hair cycle per regions

Name	Sex	Age in hours	Frontal region			Parietal region			Occipital region		
			Anag	Catag	Telog	Anag	Catag	Telog	Anag	Catag	Telog
NC	F	24			37	16		4	6		9
NA	M	3	15		6		17		2	18	2
NC	F	28	18			20			21		
NA	M	20	15		1	26	1	1	31		
NC	M	10			29	11	3	7	20	3	
NN	F	76	1	5	10		22		20	6	
NR	M	16			16			21	20	2	
NP	F	18	44	2	20	41	6	7	42	9	1
NS	F	10	46		4	34		16	13		38
NF	F	10	44		8	36		2	42		
NL	M	18	35	1		29			50		
NS	M	3	50			24	3	3	25	5	
NA	M	30	8		20	31			41		
NM	M	10	3	1	31	31	5	4	42	1	
NN	F	5		3	27		46		39	2	
NC	M	12			25		31		31	1	
Totals			279	12	234	299	134	65	445	47	50
%			53.2	2.2	44.6	60	26.5	13.5	82	86.7	9.3

TABLE II

New born children
Dark complexion
Phases of the hair cycle per regions

Name	Sex	Age in hours	Frontal region			Parietal region			Occipital region		
			Anagen	Catagen	Telogen	Anagen	Catagen	Telogen	Anagen	Catagen	Telogen
NG	M	18	27			27			28		
NM	F	10	19			36			35		
NC	F	15	38			50			50		
NR	M	18	44			61			38		
NS	F	5	17			15	1		55		
NP	F	10	25	1		34			50		
NA	M	18	28			31			41	2	
NA	M	7	20			17			19	1	
NS	F	10	46		4	34		16	13	38	
Totals			264	1	4	305	1	16	329	41	
%			98.2	0.37	1.5	95.2	0.3	4.54	89	11	

fore birth, the hair in the frontal and parietal regions in most cases will be found already in catagen or telogen phase and provides the first hair-shedding event for the individual. The transition from anagen to telogen is at this period completed in a short space of time. The occipital region is exceptional in that this transition is delayed until birth, being completed thereafter (Graphs 1 and 3).

About 6 weeks before birth, a decrease in the number of telogen hairs takes place in the frontal and parietal regions, an indication of the second hair neogenesis in these regions.

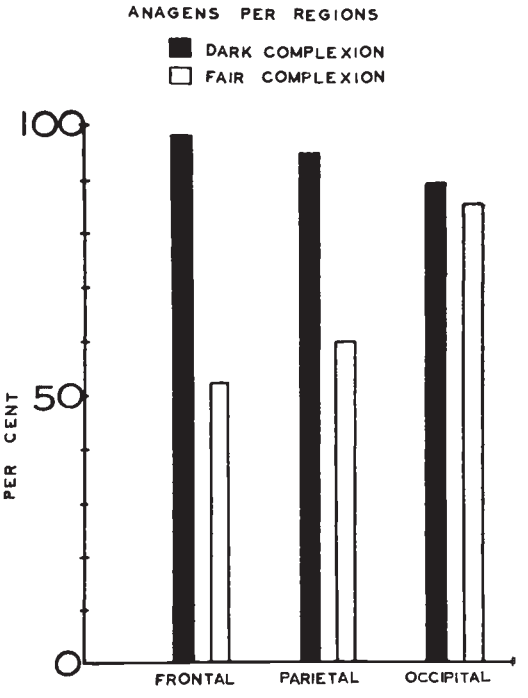
In the majority of cases, at the moment of birth there is an integration of the phases so that all hairs tend to enter the telogen phase of the cycle. The transition of the great proportion of hair in the frontal, parietal, and occipital regions to the telogen phase immediately after birth presages the second normal shedding event of the scalp. All normal changes in phase that will take place after this time on the scalp will occur more irregularly, less precipitously, and in a mosaic pattern.

From the 3rd to 4th month after birth, differences related to skin complexion cease to be evident in any significant way.

The correlation of increasing proportion of medullated hairs with increasing age, suggests a link between the existence of a medulla and the maturation of hair cycle.

In this first stage of the natural history of the human scalp hair cycle the changes in the phases of the cycle are of sudden onset, of short duration (days or weeks), and are wave-like, beginning in the frontal region and progressing towards the occipital region. Thus at this early age in man, there are similarities to events in the first few weeks of life of certain rodents.

Before birth there exists in parietal and frontal regions two periods of hair neogenesis: the original or primordial, corresponding to the formation of the first hairs, and that which takes place between the 6th and the 5th week before birth, while in the occipital region there occurs only one, which starts just before birth. We propose designating these periods of hair neogenesis as embryonic and fetal respectively, and the shedding as primary and secondary.



In all scalp regions, from the beginning of the hair growth until the 18th week after birth, the cycles have an approximately uniform duration. From the 18th week of postnatal life the hair, individually or in groups, manifest a modification of the duration of the cycles, changes which result in a mixed distribution (mosaicism) of the different phases of the cycle over the entire scalp. The establishment of this new randomness, slow, progressive and apparently anarchical, introduces the pattern which will rule for the rest of the lifetime except for departures produced by pathologic conditions.

SUMMARY

During fetal life and for the 10-week period following birth changes in the phases of the cycle of scalp hair growth are sudden, of very short duration (days or weeks) and occur almost simultaneously in all the hair of the scalp. The changes start in the frontal region and extend in waves towards the occipital region.

The scalp can be covered with hair totally in anagen phase before and immediately after birth. This phenomenon is not repeated under normal conditions at any other time during the lifetime of the individual.

From the 18th week after birth, changes in growth patterns progressively adopt the mosaic pattern characteristic of the adult.

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